

LIII. *An Account of a Treatise in French, presented to the Royal Society, intituled, "Lettres sur l'Electricité, by the Abbé Nollet, Member of the Royal Academy of Sciences, &c. &c." By William Wat-son, M. D. R. S. S.*

Gentlemen,

Read Dec. 17, 1761. **A**BOUT eight years since, the learned and ingenious author of the work before us published a treatise, of which the present work may be considered as a continuation. That consisted of nine letters upon the subject of electricity, which were addressed to persons, who had distinguished themselves by their endeavours to illustrate this part of natural philosophy. In like manner, the present performance consists of eight letters, and is addressed, as the former, to his friends and correspondents.

As an account of the former treatise was communicated by myself to the Royal Society, and printed, by direction of the council, in the Philosophical Transactions \*, the author requests, at the end of the sixteenth letter, which is addressed to me, that I would give myself the additional trouble to lay before you an account of the present work. This request I most readily comply with, not only in obedience to the order of the Society, but likewise as a testimony of

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\* Vide Vol. XLVIII. p. 201.

the esteem and regard, which I have long entertained, and shall continue to do, for the excellent author of it.

The principal design of the work before us, is to support, and further confirm, the hypothesis of the author, and of several other persons, who have considered these matters, *that the effects of electricity depend upon the simultaneous affluence and effluence of the electric matter.* This treatise, like the former, is printed in 12mo. and contains 284 pages, exclusive of the preface, and four tables, exhibiting fourteen figures.

In defending his opinions, in relation to the effects of electricity, the Abbé Nollet has given a variety of new experiments, which cannot but be agreeable to those, who are conversant in these matters. He has also occasionally mentioned those of other persons, which are come to his knowledge, and which he apprehends not to be sufficiently known. He has traced the origin of several happy inventions, and has exhibited to us the real authors of them. He has given, as he imagines, additional value to several experiments, which appear to him to have been too much neglected; and brought others, which have been over-rated, to their proper standard.

As this work is of a controversial kind, the author has had particular attention to such points, as have been the occasion of contest; to weigh the reasons of his opponents, and to add new explanations to such of his opinions, as seemed to want them; more particularly, to such as have appeared to him to have been misunderstood.

The first of these letters is addressed to M. Necker, professor of experimental philosophy at Geneva. In

this letter, our author endeavours to establish his opinion, published long since, in regard to the existence of the simultaneous affluence and effluence, and consequently the double current, of the electric matter, in opposite directions. And herein our author, by a series of experiments, obviates some doubts, which had occurred to Mr. Necker, in relation to the validity of this hypothesis.

The second letter is addressed, as the former was, to M. Necker of Geneva. In this letter, the hypothesis of M. Jallabert of Geneva, a very worthy member of this Society, in relation to the electrical phenomena, is examined; and such part of it, as does not coincide with the ideas of our author, he endeavours to confute by an ingenious series of deductions.

The third, fourth, and fifth Letters are addressed to M. Du Tour, of Riom in Auvergne, who has been a diligent enquirer into the nature and properties of electricity. In the first of these, is a careful examination of the validity of the doctrine of *plus* and *minus* in bodies electrified. So early as in February 1745, I communicated to the Royal Society an experiment, and some deductions therefrom, which laid the foundation of this doctrine. This experiment, and the deductions in consequence of it, were afterwards printed in the Philosophical Transactions \*. These I explained more at large, both by experiments and observations, in another paper, read to the Society in February 1745-6 †, and were the experiments, which so early caused me to conceive, that there was

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\* Vide Vol. XLIV. p. 739.

† See Phil. Transf. Vol. XLV. p. 93—101.

something in the phænomena of electricity, not to be resolved, but upon statical principles; and enabled me first to assert, that the phænomena in bodies electrified, however similar they might appear, did really arise *from their electricity being either greater or less than their natural quantity*. This doctrine has, since that time, been the cause of a vast variety of experiments, both here and abroad, by which great light has been thrown upon this part of natural philosophy. How far our author has been able to overturn this doctrine, must be left to other judges to determine.

In the fourth letter, the doctrine of resinous and vitreous electricity is examined. In this letter, as well as in the fifth, a great number both of experiments and deductions are produced, not only to weaken the doctrine of *plus* and *minus*, but to establish the principle of *simultaneous affluence* and *effluence* of electric matter; as, if this principle is allowed, the doctrine of resinous and vitreous electricity may be reduced to it: as our author is of opinion, that there is only one and the same kind of electricity, whether it is natural or artificial; and that, however appearances may make it seem to vary, the electricity is one and the same.

The sixth letter is an answer to one of Father Beccaria, professor of experimental philosophy in the university of Turin, published in Italian, in the year 1753, and addressed to the Abbé Nollet. This letter of Pere Beccaria was translated into French, and published at Paris in 1754, by M. Delor, with many additions and annotations. It contains a very great number of curious experiments and observations,

Both upon artificial and natural electricity; many of which are brought to prove the validity of the doctrine of our worthy member Dr. Franklin, in opposition to that of the Abbé Nollet. More particularly, he endeavours to confute the abbé's opinion, in relation to the affluence of the electric matter, which the abbé has, by experiments and observations, ingeniously endeavoured to confirm. Pere Beccaria's observations upon natural electricity, and upon meteors, on which he has made a prodigious number of experiments, many of them of a delicate nature, do him a great deal of honour.

The seventh letter, the ingenious author does me the honour to address to me. In this letter, he, with justice, laments the calamities of war; more particularly, as it, in a great degree, prevents that correspondence between men of letters, which contributes so much to their mutual satisfaction, and upon which the improvement of science so much depends. The more particular purport of this letter, is to answer some objections, which Mr. David Colden, of North America, published against the former letters of our author. These relate more particularly to the impermeability of glass to the electric fluid, and to the explanation of the phenomena of the experiment of Leyden. Besides these, he gives us his idea of non-electrified bodies electrified *plus*, as he does not approve of the idea generally received of the *accumulation* of electricity. He mentions, that he has read Mr. Canton's memoir *relating to electricity, with his observations upon stormy clouds*. He finds many curious facts in that work; but thinks them not sufficient to make the deductions Mr. Canton has done, in favour of the doctrine

doctrine of *plus* and *minus*. M. Du Tour of Riom, has sent the Abbé Nollet a memoir, which he has likewise been so kind as to send me, containing a review of these experiments, from which he thinks it very easy to resolve all these phænomena, upon the doctrine of simultaneous affluence and effluence of the electric matter.

The eighth letter is addressed to M. De Romas, assessor to the presidial of Nerac, and contains remarks upon electrical kites; upon Father Ammerfin's manner of preparing and using wood to *insulate* bodies, in making electrical experiments; and likewise some observations concerning the doctrine of simultaneous affluence and effluence of the electric matter. M. De Romas, in flying his electrical kite, was the first who used a cord composed of hemp and wire. This compounded cord conducted the electricity of the clouds far more perfectly than a hempen cord would do, even though it was wetted; and this cord being terminated by one of dry silk, enabled the observer, by a proper management of the apparatus, to make what experiments he thought proper, without danger to himself. The Abbé Nollet, however, desires M. De Romas to be very cautious in making these experiments, and not too much to confide in his silk lines; as the vastness of the electrical matter in thunder-storms may overcome the property of the silk, and even make it a conductor of electricity, and hazard the life of the observer. The quantity of electricity brought by M. De Romas's kite from the clouds has been so great, that, on the 26th of August 1756, " the streams of " fire were an inch thick, and ten feet long, which " were conducted by the cord of the kite to the

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“ non-electric bodies near it, and the report of which “ was equal to that of a pistol.” If a stroke of this kind had gone through the body of M. De Romas, probably the late unfortunate Professor Richmann had no longer been the only martyr to electricity.

Father Ammerfin’s method of preparing wood, so as to make it serve the purpose of glass, wax, &c. in electrical experiments, was published at Lucerne in the year 1754, and our author has given us an extract of it at the end of his work. This father found, that the frying of wood, after its being well dried in an oven, or otherwise, in either the oil of walnuts or that of linseed, made it fit to *insulate* those bodies, which you chose to electrify, by preventing the dissipation of the electricity: not only so, but what makes it still more valuable to those, who are engaged in these pursuits, you may excite electricity with it, as the Abbé Nollet says he has done, to his great convenience. He says further, that the end of a board mounted upon four pegs, a pair of wooden shoes, some truncheons of beech, walnut, or lime, &c. fried in oil, cost him but little, and answered his purpose better than cakes of wax, pitch, rosin, and all the supports of glass or silk, which he had employed before: and, in case of necessity, a cylinder of this prepared wood, or a globe turned out of it, will excite an electricity so strong, that you need not be at the trouble of exciting it with other bodies. Father Ammerfin himself employs common wooden measures, such as are usually found in granaries, first boiled in oil, and afterwards mounted so as to be turned by his wheel.

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The Abbé Nollet, being desirous of supporting the validity of some opinions of his, in relation to the nature and properties of electricity, desired of the Royal Academy, that a committee should be appointed, to examine the truth of some experiments, which the abbé considered as proofs of what he had established. A committee was accordingly appointed, which consisted of Messieurs Deparcieux, Fougereux, Bezout, Tillet, and Briffon, who all attested to the academy, that the results of these experiments, at the making of which they were present, were such as the abbé had foretold, in a memoir, which had been read to the academy; an attestation of which is given in this work, signed by M. De Fouchy, secretary to the academy, and is dated 10th April 1760.

These experiments are sixty in number, some of which are subdivided to more subordinate ones, and are most of them exceedingly well chosen. They tend to prove the simultaneous affluence and effluence of the electric matter, a doctrine long since espoused, and very well supported by our author; but vehemently, and with much asperity, controverted by some gentlemen at Paris. For a detail of these experiments, I must refer you to the work itself; and as they without doubt are very fairly stated, every person conversant in these enquiries will carefully consider them, and, at the same time, reflect how far the hypothesis is deducible from the phænomena.

I am, with the most profound respect,

Gentlemen,

Your most obedient

humble servant,

May 24, 1761.

W. Watfon.